Innovative Systems Design and Engineering
ISSN 2222-1727 (Paper) ISSN 2222-2871 (Online)
Vol 3, No 4, 2012
www.iiste.org

Assessing the Relationship of Kinematics with Dribbling Performance of Basketball at Different Phases

Shrikrishna Patel[1*] Upendra Pandey[2] Sanjib Kumar Bhowmik[3]

1. Faculty of Education, D.A-V. Training College 10-11, Barsaitpur, Kalyanpur, Kanpur, INDIA PIN – 208024
2. Department of Physical Education, C.S.J.M. University Kalyanpur, Kanpur, INDIA PIN – 208024
3. Department of Physical Education, Tripura University Suryamani nagar, Tripura (West) INDIA PIN – 799022

* E-mail of the corresponding author: krishna_phd2@yahoo.co.

Abstract

Purpose: The purpose of the study was to assess the relationship of kinematics with dribbling performance of basketball at different phases. **Material and Methods:** Twenty randomly selected male students aged 18-28 years and who participated in North Zone Inter University Basketball Championship 2010-11 held at CSJMU Kanpur. The data was collected by the help of A Casio Exilim F-1 High Speed Camera and Siliconcoach pro 7 motion analysis system. The Pearson's product moment correlation coefficient was used to measure the relationship between selected kinematics variables with the performance of high dribble. The level of significance was set at 0.05. **Results:** The results have shown the values of coefficients of correlation of selected angular kinematics variables at moment preparation phase in High dribble were: right ankle joint (0.187), right knee joint (-0.010), right hip joint (-0.144), right shoulder joint (0.433), right elbow joint (-0.165), right wrist joint (-0.015) and Height of C.G. (0.137). In case of moment execution phase were: right ankle joint (0.197), right knee joint (-0.126), right hip joint (-0.144), right shoulder joint (0.188), right elbow joint (-0.346), right wrist joint (-0.060) and Height of C.G. (0.137). **Conclusion:** The statistical findings indicate that there exists an insignificant relationship between High dribble performance and Ankle (Right), Knee (Right), Hip (Right), shoulder (Right), Elbow (Right) & Wrist (Right) joints and Height of center of gravity at moment preparation and execution.

Keywords: High dribble, kinematics, Siliconcoach pro 7 motion analysis

1. Introduction

Basketball is a popular sport in the world. This is evident from the audience level of NBA. Not only a complete organization, but also technical needs, tactic, agreement, experience and the potential for contest is shown in a game (Chiou, 2001).

The fundamentals of dribbling the basketball should be the first area of the game taught. Handling the ball is the foundation of the game. This skill, along with shooting, is the fun part of basketball for most players and we see many young players copying their NBA idols with all types of fancy ball work but so often they have not been taught that there are only two reasons to dribble the ball. Firstly it is used to penetrate the ball (toward the basket) and secondly to create a better passing angle, however, if the defense is tight and the passing lanes clogged, the dribble is used to set up the offense. Since the dribble can only begin and stop one time it is in a player's possession, he should make his dribble count. Every single dribble should have a purpose: Move the ball on offense; Blow past your man to the hoop; Escape from a tough and sticky defense; Shoot; Move around a screen and get off your shot behind it; Get a better passing angle and Freeze the ball in the closing minutes. (Adkins, 2007)

The execution of the dribbling technique is quite simple - it is the action of pushing the ball to the floor by using the extended fingers and thumb which grip (wrap around the ball on contact) and by moving the wrist and the elbow up and then down. There are two types of basketball dribble: the high basketball dribble which you need for speed in bringing the basketball down the floor or driving for the basketball hoop, and the low basketball dribble which is needed when you are trying to protect the basketball while you are in

the act of basketball dribbling.

The high basketball dribble should be bounced between the knee and the hip area, the low basketball dribble at knee level or lower. As a player, you must know when to use each type of basketball dribble; otherwise, the opposing player guarding you would be more likely to steal the basketball from you--this is a skill that you can learn with the proper basketball dribbling drills. (Jain, 2003)

The majority of coaches identify shooting as the most important skill of basketball. (Huang, 2006; Miller, 1996; Bartlett, 1993; Ferreira - 2009), this does not preclude the importance of other skills - dribbling, passing or footwork , however very few research was conducted on dribbling performance (Hirata, 2011; Fujji, 2010; Katshuhara, 2010), However, there is not so much literature of the kinematics of the high dribbling to players, coaches and basketball loving people.. Therefore, the purpose of this study was to investigate the Relationship of Kinematics with Dribbling Performance of Basketball at Different Phases

2. Materials & Methods

The study was delimited to male basketball players who participated in North Zone Inter University Basketball Championship 2010-11 held at CSJMU Kanpur. The study was further delimited to the 20 subject belonging to the age group 18 to 28 years. The all subjects were right handed. The scores of the subjects in high dribble were used as the criterion variable in the study. The performances of the subjects were assessed by three judges. Judges gave marks according their subjective observation from five point scale.

Siliconcoach pro 7 software was used for kinematical analysis of high dribble in basketball. A Casio Exilim F-1 High Speed Camera, which was positioned at 7.90m from the subject at height of 1.50m. from the subject on an extension of free throw line. Camera was also set for capturing 300 fps. The subjects were made to take three Shots only. The linear and angular kinematical variables of the body were calculated at moment preparation and moment execution.The videos as obtained by the use of digital videography were analyzed (the best trial) by Siliconcoach pro 7 software. Only one selected frame was analyzed. Selected variables were as Ankle joint, Knee joint, Hip joint, Shoulder joint, Elbow joint, Wrist joint and height of C.G.

The data was analyzed by use of person's product moment correlation. The level of significance chosen to test the hypothesis was 0.05.

3. Results

Table - 1 indicates that there exists an insignificant relationship between High dribble Performance and Ankle (right), Knee (right), Hip (right), Shoulder (right), Elbow (right) & Wrist (right) as the correlation coefficient values were found higher than the tabulated value. at .05 level of significance. **S**ince no significance relationship was found between high dribble performance and angular kinematic variables at moment preparation phase.

Table - 2 indicates that there exists an insignificant relationship between High dribble performance and height of centre of gravity as the correlation coefficient values were found higher than the tabulated value. at .05 level of significance. **S**ince no significance relationship was found between high dribble performance and linear kinematic variables.

Table - 3 indicates that there exists an insignificant relationship between High dribble Performance and Ankle (right), Knee (right), Hip (right), Shoulder (right), Elbow (right) & Wrist (right) as the correlation coefficient values were found higher than the tabulated value. at .05 level of significance. **S**ince no significance relationship was found between high dribble performance and angular kinematic variables at moment execution.

Table - 4 indicates that there exists an insignificant relationship between High dribble performance and height of centre of gravity as the correlation coefficient values were found higher than the tabulated value. at .05 level of significance. **S**ince no significance relationship was found between high dribble performance and linear kinematic variables at moment execution.

4. Discussion

In present study the insignificant result may be due to

1. Less sample size, non availability of sophisticated equipments and biomechanical software's.
2. Participants may not be familiar with the test of high dribble in basketball, as (Kernozek et. al, 2008) suggested Sport-specific neuromuscular training programs for basketball players could consider may adding ball control tasks.
3. Most importantly the correct skill of executing high dribble were differ from player to player, and in present investigation players were not categorized as skilled or unskilled player but it was noted that skilled Performer starts in an athletic stance (for right handed) with right foot slightly in front of the left foot. The left arm is slightly bent and in front of body protecting the ball. Right hand is in contact with the ball only with the pads of the fingers. Movement of the ball from the hand to the floor and back to the hand and position of head was looking upright. The skilled players employed the external-internal rotation and adduction-abduction of the shoulder, and the forearm supination-pronation to manipulate the ball in a lower position and with a longer contact time than unskilled player (Katsuhara, 2010; Fujii, 2010; Hirata, 2011)

5. Conclusion

The statistical findings indicate that there exists an insignificant relationship between High dribble performance and Ankle (Right), Knee (Right), Hip (Right), shoulder (Right), Elbow (Right) & Wrist (Right) joints and Height of center of gravity at moment preparation and execution. Although these joints are important in performing the high dribble but statistically it could not be proved in relation to this study. It may be due to the nature of the movement which only requires the tapping the ball and not required more amount of force so the joints contribution is very less and not proved statistically. Height of the centre of gravity is also of less importance because the required balance for performing high dribble is actually provided by the diagonally placement feet.

6. References

Adkins C., Bain S., Dreyer E., Starkey R., (2007). *Basketball Drills, Plays and Strategies: A Comprehensive Resource for Coaches*, Ohio: Better way Books

Berry, W.J.D. (1970). *Basketball for schools.* London: Pelham Books.

Bunn, J.W., (1989). *Scientific Principles of Coaching. Englewoods Cliffs,* New Jersey: Prentice Hall Inc.

Chiou Tah- Tzong (2001). Techniques and Tactics of Professional Basketball – Huang – Kao Elephant Team; Unpublished Doctoral Dissertation, National College of Physical Education and Sports, Taipei, Taiwan

Clarke D.H., & Clarke H. H., (1970). *Research Process in Physical Education,* (2nd ed.). Englewood Cliffs, New Jersey: Prentice Hall Inc.

Ferreira, A.O. Fernandes, J.A. (1997). Kinematics in Basketball Shooting-The Influences of Basket Height and Ball Size, SBS-Conference *Proceedings Archive, 15 International Symposium on Biomechanics in Sports.*

Fujii S., Yamada Y., & Oda S. (2010) Skilled Basketball players rotate their shoulders more during running while dribbling. *Perceptual and Motor skills.* 110(3 pt. 1): 983-994.

Hall, S.J. (1995). *Basic Biomechanics.* California: California state university Northridge.

Hay, J.G. (1993). *The Biomechanics of Sports Techniques.* (4th ed.). :Benjamin Cummings.

Jain, N., (2003). *Play and Learn Basketball*, New Delhi: KSW.

Kai H., Masatoshi S., & Yasuto K. (2011) Comparison of the Hand-Dribbling Motion between Skilled and Unskilled Subjects. *Portuguese Journal of Sport Sciences,* 11 (Suppl. 2), 85-87.

Katsuhara Y., Fujii S., Kametani R., & Oda S. (2010). Spatiotemporal characteristics of Rhythmic,stationary basketball bouncing in skilled and unskilled players. *Perceptual and Motor skills.* 110: 469-478.

Miller, S. & Bartlett R. (1993).The effects of shooting distance in the basketball jump shot. *Journal of Sports Sciences,*

11, 285-293.

Miller, S. & Bartlett R. (1996). The Relationship Between Basketball Shooting Kinematics, Distance and Playing Position. *Journal of Sports Sciences,* 14, 243-253.

Tsai, Chi-Yang, Ho, Wei-Hua, Lii, Yun-Kung, Huang, Chin-Lin (2006). The Kinematic Analysis of Basketball Three Point Shoot After High Intensity Program, *XXIV ISBS Symposium, Salzburg-Austria.*

Wickstorm R. L., (1977). *Fundamental Motor Pattern,* (2nd ed.). Philadelphia: Lea & Febiger.

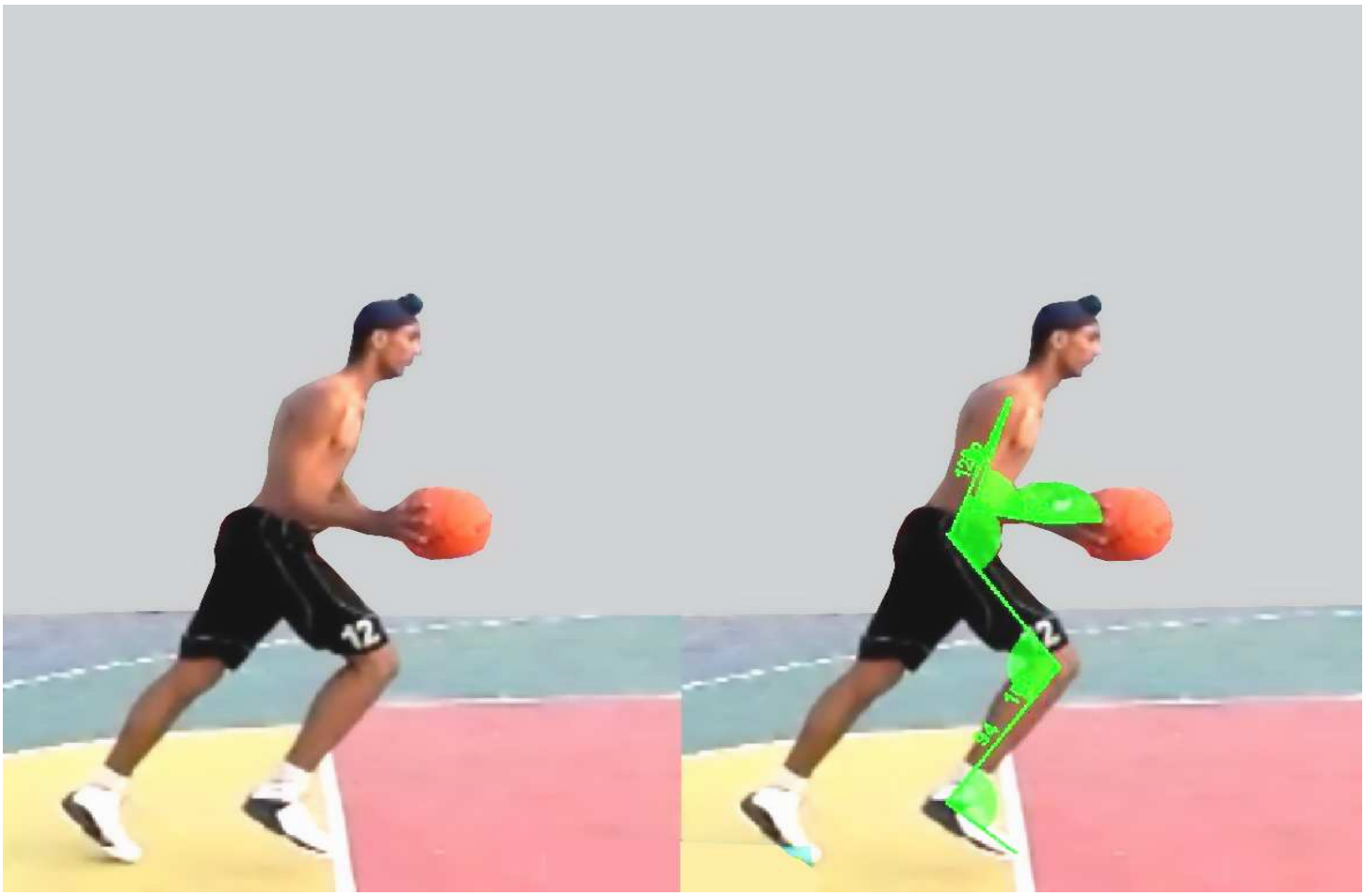

Figure 1. High Dribble at the Moment Preparation Phase

Table 1. Correlation between Dependent variable (High dribble Performance) and Independent variables (selected angular kinematic variable) at moment preparation phase

Independent Variables	**Correlation coefficient**
Ankle joint (Right)	0.187
Knee joint (Right)	0.010
Hip joint (Right)	-0.144
Shoulder joint (Right)	0.433
Elbow joint (Right)	0.165
Wrist joint (Right)	-0.015

r.05 (18) = .444

Figure 2 High Dribble Performance at Moment Preparation Phase

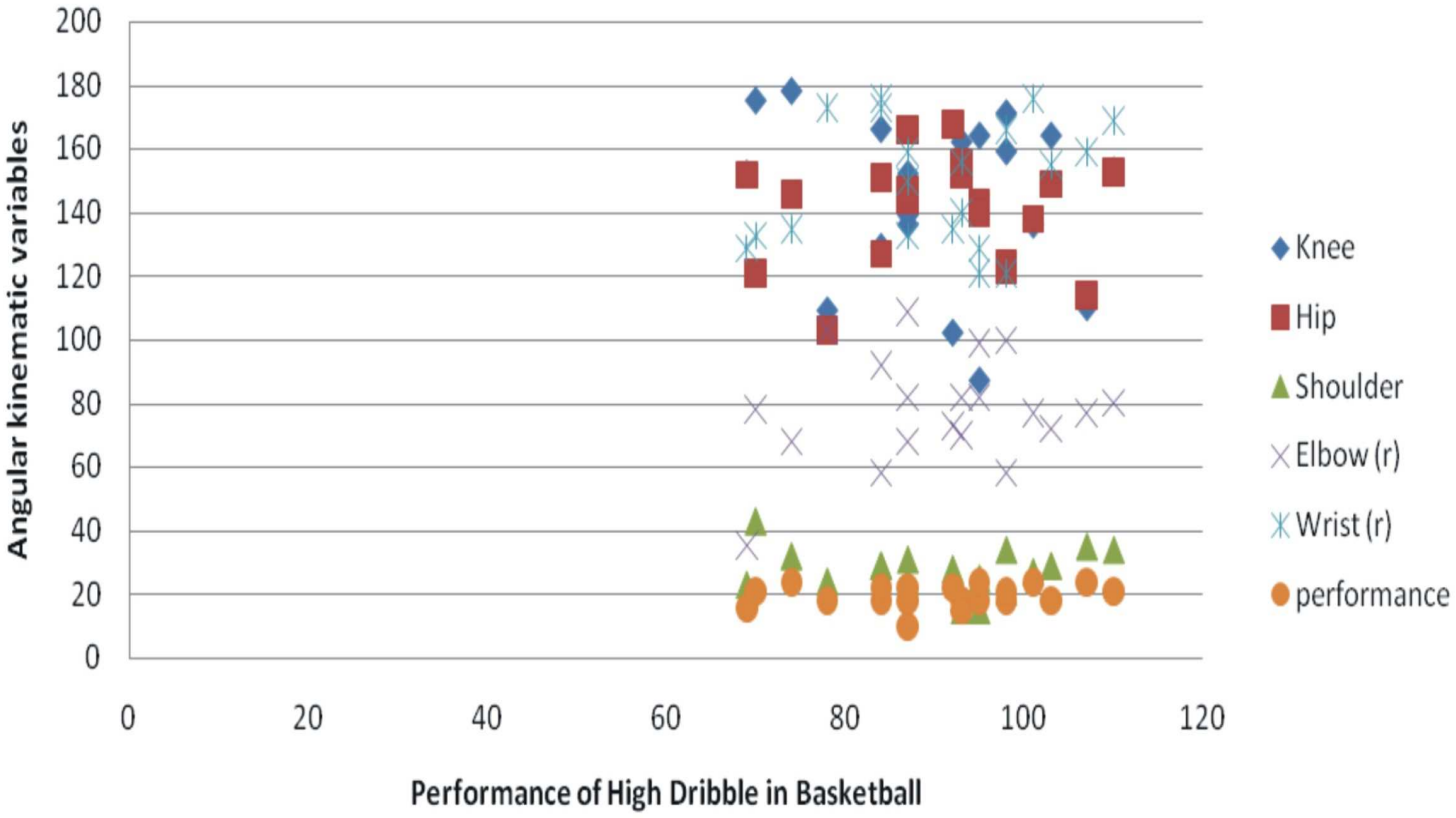

Table 2 Correlation between Dependent Variable (High dribble performance) and Independent Variables (selected linear kinematic variable) at Moment Preparation Phase

Independent Variables	Correlation Coefficient
Height of Centre of gravity	0.137

r.05 (18) = .444

Figure 3 High Dribble at Moment Execution Phase

Table 3 Correlation between Dependent variable (High dribble Performance) and Independent variables (selected angular kinematic variable) at Moment Execution Phase

Independent Variables	Correlation coefficient
Ankle joint (Right)	0.197
Knee joint (Right)	-0.126
Hip joint (Right)	-0.144
Shoulder joint (Right)	0.188
Elbow joint (Right)	-0.346
Wrist joint (Right)	-0.060

r.05 (18) = .444

Figure 4 High Dribble Performance at Moment Execution Phase

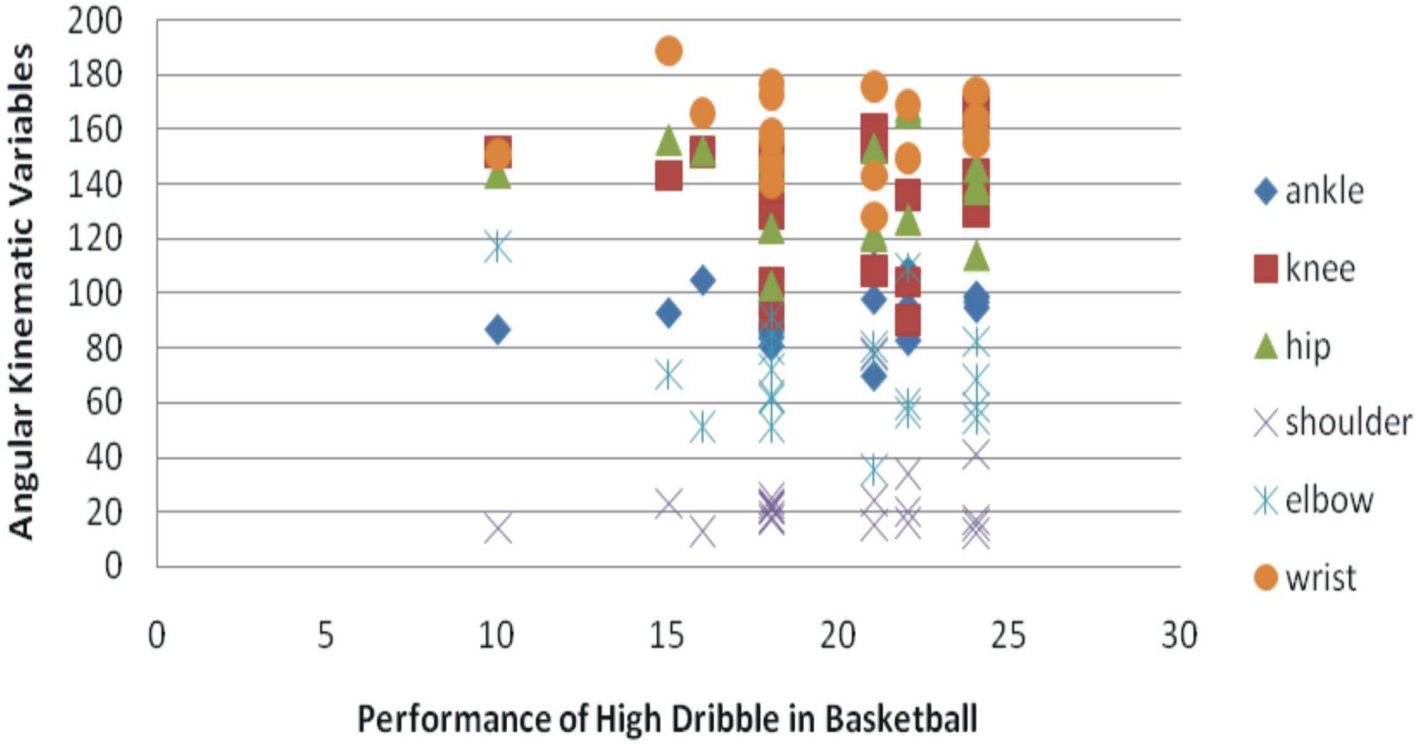

Table 4 Correlation between Dependent Variable (High dribble performance) and Independent Variables (selected linear kinematic variable) at moment execution

Independent Variables	**Correlation Coefficient**
Height of Centre of gravity	0.137

r.05 (18) = .444